

CLAIMS

We claim:

1 1. A microchannel mixing device for electrohydrodynamic mixing of
2 fluids, comprising:
3 a mixing channel, said mixing channel having an inlet for receiving at least
4 one fluid;
5 at least one supply channel fluidically connected to said mixing channel inlet
6 for transport of said fluid into said mixing channel inlet, and
7 at least two electrodes for imposing an electric field in said mixing channel,
8 at least one of said electrodes adapted for charging at least a portion of said fluid.

1 2. The mixing device of claim 1, wherein said at least one supply channel
2 comprises a first supply channel for a first fluid and a second supply channel for a
3 second fluid.

1 3. The mixing device of claim 2, wherein at least one of said electrodes
2 is disposed within said first or second supply channels.

1 4. The mixing device of claim 1, wherein at least one of said electrodes
2 is a fluid isolated electrode disposed in a location which is not in contact with said
3 fluid.

1 5. The mixing device of claim 1, wherein said mixing device further
2 comprises a cover plate in contact with a substrate.

1 6. The mixing device of claim 5, wherein said mixing channel and supply
2 channel are formed in said cover plate.

1 7. The mixing device of claim 5, wherein said cover plate is gas
2 permeable.

1 8. The mixing device of claim 5, wherein said substrate comprises silica
2 or glass.

1 9. The mixing device of claim 1, further comprising at least one power
2 supply for applying a DC, pulsed DC or AC voltage to any of said electrodes.

1 10. The mixing device of claim 9, wherein said power supply comprises at
2 least two independent power supply channels.

1 11. The mixing device of claim 2, wherein said first and second fluids are
2 mixed in said mixing channel, wherein at least one product is formed from a
3 reaction.

1 12. The mixing device of claim 1, wherein said electrodes are positioned
2 along a length of said mixing channel, wherein a potential difference applied
3 between said electrodes produces an electric field oriented substantially parallel or
4 anti-parallel to a direction of flow of said fluid in said mixing channel.

1 13. The mixing device of claim 1, wherein said electrodes are positioned
2 transverse to a length of said mixing channel, wherein a potential difference applied
3 between said electrodes produces an electric field oriented substantially transverse
4 to a direction of flow of said fluid in said mixing channel.

1 14. A method for electrohydrodynamically mixing fluids, comprising the
2 steps of:

3 delivering at least one fluid into a mixing channel;
4 inducing a charge on at least a portion of said fluid; and
5 applying an electric field across at least a portion of said mixing channel,
6 wherein at least one of said fluid is mixed.

1 15. The method of claim 14, wherein said electric field originates or
2 terminates outside said mixing channel.

1 16. The method of claim 14, further comprising the step of releasing gas
2 evolved from said applying step.

1 17. The method of claim 16, wherein said releasing step comprises
2 diffusion across a gas permeable layer.

1 18. The method of claim 14, wherein said applying step comprises
2 application of a DC voltage.

1 19. The method of claim 14, wherein said applying step comprises
2 application of a time varying voltage signal.

1 20. The method of claim 19, wherein said time varying voltage signal
2 comprises a pulsed DC signal.

1 21. The method of claim 14, wherein said applying step comprises
2 applying voltage using at least two independent power supply channels.

1. 22. The method of claim 14, wherein said electric field applied is
2 substantially parallel or anti-parallel to a direction of flow of said fluid in said mixing
3 channel.

1 23. The method of claim 14, wherein said electric field applied is oriented
2 substantially transverse to a direction of flow of said fluid in said mixing channel.